SECOND SECTION
PAGES 9 TO 16.

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Hawaii and Its Volcanoes

A Review of Professor Hitchcock's New Book by Thomas A. Jagger, Jr.

To those who are interested in the founding of an Observatory at Kilauea, a publication just at this time of two valuable memoirs on the Hawaiian volcanoes, appears timely and fortunate. Dr. Brigham is putting through the press a splendid memoir of the Bishop Museum, by himself, on the history of the active volcanoes of the Island of Hawaii, and Professor Hitchcock now publishes a geologist's careful studies after repeated visits to the Islands. These gentlemen are eminently fitted for their respective tasks, and from a scientific standpoint, it is to be hoped that the two volumes will be somewhat in disagreement. Legitimate controversy based upon honest scientific work is the best possible stimulus to progress and eventual discovery of truth. For this reason we are very glad that there are two books coming out instead of one, so that we may have different points of view presented.

For the work of the proposed Observatory, the first task necessary is the making of a summary of what is known concerning these volcanoes. Apparently this work has been made very easy for the new observers by the excellent compilation of historical data contained in Professor Hitchcock's book. The book is particularly valuable at this time because of the humane interest which is being taken in volcanoes and earthquakes, and also because of the extensive economic and military development of the Hawaiian Islands. Recent disasters the world over have at last awakened an intense interest in seismology and volcanology and our newspapers are beginning to print reports of the records of seismographs and of the sources of their movements. Hence anything dealing with a great volcano center is bound to attract attention at once and Professor Hitchcock's book should have a wide circulation.

Professor Hitchcock's Qualifications.

Prof. C. H. Hitchcock is well fitted for the task he has here assumed. For years Professor of Geology in Dartmouth College, after making repeated visits to the Hawaiian Islands, and writing scientific papers on the geology of the volcanoes, he at length retired from teaching and took up his residence in Honolulu. This gave him the opportunity for just the sort of scholarly activity necessary to write a critical review of all the records of these volcanoes, as written by travelers and scientific men. He states at the outset that he has tried "to describe briefly the phenomena connected with the discharges of molten lava from the two great Hawaiian volcanoes." His contribution is limited to a statement of the facts, with very brief treatment of theories.

The book is divided into four parts and an appendix. The parts deal respectively with the physical geography of the archipelago, history of Mauna Loa, history of Kilauea and discussion of the Hawaiian type of volcanic action. The appendix treats of earthquakes in Hawaii, Prof. William Pickering's theory of the origin of the moon from the Pacific basin, spectroscopic and analytical chemistry of the volcanoes, and biographical notes on Dana, Coan, Green, Bishop, Brigham and Dutton. The illustrations are numerous in half-tone and photolithograph and are well reproduced.

The Publishers.

The work of the makers of the book, the Hawaiian Gazette Company, is excellent, and the typography and proof correcting good. It will be remembered that this company was the publisher of that remarkable book by William Lowthian Green, entitled "Vestiges of the Molten Globe", which presents vividly the so-called tetrahedral theory to account for the shape of the earth.

Professor Hitchcock's new volume is strictly eclectic. The work of the author in the field has been primarily geological and he presents his results in the first part by means of a concise statement of the physical geography and structure of the Islands. Each Island is treated separately including the low islets and reefs which extend far to the northwest, and a fairly complete discussion of the geology of Oahu is given, with notes on the artesian waters, and a discussion of the small extinct craters such as Punchbowl and Diamond Head. The greater part of the remaining text of the book is taken up with orderly compilation of the statements of visitors to the several volcanoes of the Island of Hawaii, and some discussion of the significance of these records.

The Geological History of Oahu.

Professor Hitchcock's personal work is well illustrated in his summary of his geological history of Oahu. There was probably submerged Tertiary land and through fissures in it lava poured out in sheets until finally the Island of Kaala arose, which became wholly covered by vegetation. Wind and rain channeled the slopes of this dome and then new piles of lava arose nearby and Koolau was formed which extendtended out to sea several miles farther to the northeast than at present. These new lands attracted corals and shellfish which have been piling limestones against them ever since, but the volcanic activity was not ended, and porous basalt was poured out at the Pali, rising through cracks, and making the fissure fillings which have since been revealed to us as dikes; in some places large lenses of lava are squeezed between old flows. Then came the beginning of explosive eruptions, and volcanic pudding-stone was formed by the broken pieces hurled out, seen typically at the Pali, and over very wide areas red ash, clinkers and lava were spread out such as are seen in the Laeloa and Tantalus craters. This kind of activity went on at different times finally forming tuff or ash craters, typical cinder cones such as Punchbowl, Diamond Head and Koko Head. The matter which formed them was blown through fissures, even through the coral reefs, so as to bury some of the reefs. Meanwhile the land was enlarging, and new reefs were formed, all decomposing to form soils: discharge of ashes and showers of stones became dominant over the lava flows, so that the latter had to content themselves with filling fissures underground which have since been revealed by erosion. Great warpings of the earth's crust produced a depression of the land beneath the sea to the extent of some 250 feet followed by elevation to the present level. The last stage in the history of the Oahu is the erosion by wind and rain at the present day and the accumulation of sand dunes.

Geologists may differ, as to detail, from Professor Hitchcock, but this history of Oahu probably typifies the history of the whole group of Islands and is a valuable and detailed study.

The History of Mauna Loa.

The history of Mauna Loa, the greatest active volcano in the world, shows a succession of recorded events from 1780 to 1907 inclusive. Like all such histories, the records prior to the middle of the 19th century were very scanty. Since that time they are increasingly full, so that it is difficult to base on them any quantitative generalizations as to frequency or intensity of eruptions. Dr. Hitchcock summarizes as follows the mechanism of development of the typical Hawaiian volcano:

"At first there is a small crater discharging lava from the summit of the dome.

"Secondly, the lava is not produced in sufficient quantity to flow over the margin, the opening is sealed and then the outermost crust breaks up. The crust is too vast to be absorbed. Blocks of it will be elevated; other sections will be absorbed and the outer wall on the makai (sea) side may give way. There will be discharges on the lower side. This may be the Mohokea stage

"Thirdly, all the segments of the crust fall into the reservoir beneath. Vertical walls encircle the pit. This is the stage of Kilauea and Mokuaweoweo

"Fourthly, the caldera with encircling walls is formed but the lower walls give way. Great rivers of lava flow to the sea. As the fires die down several craters are developed on the principal floor. This is Haleakala

"Fifthly, the eruption of the smaller craters multiply and the whole pit is filled. The caldera is smothered, the smaller craters continue to be developed until the internal reservoir is exhausted. This is the Mauna Kea stage."

This description of the sequence of events is somewhat too concise and the reviewer believes that Dr. Hitchcock has not laid stress enough on the growth of explosive activity in the Haleakala and Mauna Kea stages. This was probably an oversight rather than a deliberate omission for I have no doubt that the author recognizes the explosive character of the cinder cones of these two volcanoes.

Volcanic Folk Lore.

If the reader of this review imagines that the book is wholly devoted to dry geological detail and theorizing, let him turn to page 175 where he will find a most instructive description of the folk lore which deals with the goddess Pele. Tennyson's "Kapiolani" is reproduced in full, and we are told that the following is a true story of the fire goddess, recovered by King Kalakaua. A family of five brothers and nine sisters emigrated from Tahiti about 1175 A. D. The names of four of the brothers when translated from the native tongue have picturesque meanings such as "the explosion," "rain of night," "the husband of thunder," "the fire thrusting child of war." The sisters were "Pele," "fiery-eyed canoe breaker," "heaven rending cloud holder," "heaven dwelling cloud holder," "quick glancing cloud holder," "the cloud holder embracing the bosom of Pele," "the red hot mountain holding clouds," "the weather garland encircled cloud holder," and the "young cloud holder." This family with many others settled near Kilauea. Kamapuaa, a coarse, black, bristly man who was called "half hog" in derision, made proposals to become the suitor of the amazon Pele. Pele rejected his proposals with contempt and a combat ensued wherein Pele's family was worsted and forced to retreat into a lava tunnel. Kamapuaa finally discovered the retreat and upon attempting to dig into it was driven away by a flow of lava. Because of this timely eruption, it was believed that Pele had the power of calling up the fire and so she became the goddess of the volcano.

Volcanic Activity at Kilauea.

Next after Mauna Loa, Kilauea is treated historically and we find that the tabulated statements of the condition of the lava lake in Halemaumau give us thirty-seven records of change between 1825 and 1907. The question of fluctuation in position of the lake of lava brings up an amusing query as to the boundary of the Bishop estate. It appears that the Bishop title is tied to the center of the lake and if the lake changes its position the boundary moves with it. It should

(Continued on Page Twelve.)